



U.S. Department of Transportation
Federal Highway Administration

Priority, Market-Ready Technologies and Innovations

Thermal Imaging Safety Screening System

Problem: Defective commercial vehicle brakes lead to roadway fatalities

In 2001, commercial vehicles (large trucks with a gross weight over 4,540 kilograms (10,000 pounds)) were involved in more than 409,000 crashes, resulting in more than 5,000 fatalities. In many cases, defective brakes and other vehicle-related safety problems are a factor in these crashes. Infrared brake screening technology can help identify maintenance needs before these deficiencies create problems on the road.

Putting It in Perspective

In 2001:

- Commercial vehicle crashes accounted for 12 percent of the year's total 42,116 fatalities.
- In 4,431 of these crashes, at least 1 person was killed; this is the fewest number of fatal crashes involving a large truck since 1996.
- In 86,000 crashes involving commercial vehicles, at least 1 person was injured.

Solution: Infrared brake screening technology is a proven, cost-effective method for detecting commercial vehicles with defective brakes

What is this technology?

Researchers have integrated infrared brake screening technology into the Infrared Inspection System (IRISystem), a minivan equipped with a rooftop infrared camera and an interior display screen. The IRISystem screens for brake defects and produces results in seconds.

How does it work?

As a commercial vehicle decelerates to enter a roadside inspection facility, an IRISystem inspector scans its wheels with a camera. The screen displays thermal images of the wheels, showing their relative temperatures. Because the application of brakes creates heat, the wheels with functional (warm) brakes appear bright white in the infrared image, while the wheels with inoperative (cold) brakes appear dark. The color image helps the operator easily identify a vehicle with functional or inoperative brakes.

The IRISystem can be used at various scale sites and other suitable inspection locations. To achieve effective results, the IRISystem should be placed at sites where commercial vehicles must apply their brakes to enter.

What are the limitations of the IRISystem?

Vehicles typically are screened at speeds less than 16 kilometers per hour (kph) (10 miles per hour (mph)), although experienced and skilled operators can screen vehicles moving as fast as 64 kph (40 mph). No useful results were obtained when mainline screening tests were conducted at 89 kph (55 mph).

Successful Applications: State studies demonstrate effective screenings

Four States—Kentucky, Georgia, North Carolina, and Tennessee—participated in a yearlong evaluation. States used the IRISystem primarily at scale sites on highways, where commercial vehicles could be screened and inspected easily. Most operators screened vehicles traveling less than 16 kph (10 mph), while experienced operators assessed vehicles moving as fast as 64 kph (40 mph). At each site, vehicles were screened by an IRISystem operator and then subjected to a standard Commercial Vehicle Safety Alliance Level 1 inspection. The Level 1 inspector was unaware of the IRISystem screening results.

Approximately 400 vehicles were screened by the IRISystem and subjected to a Level 1 inspection. To improve the study's objectivity, 62 vehicles with no apparent problems (according to IRISystem operators) also were selected for Level 1 inspections. These non-problematic vehicles represented 16 percent of the total population of commercial vehicles tested. Approximately 70 percent of the vehicles inspected were loaded with cargo.

The study showed that the IRISystem could be used effectively to screen commercial vehicles for inspection of brake-related problems. Kentucky established an effectiveness criterion that 50 percent of the vehicles identified by the IRISystem as problematic should be confirmed as defective by the Level 1 inspection. All four States met this criterion. Overall, 59 percent of the vehicles identified as problematic by the IRISystem were placed out-of-service for brake violations. The study further revealed that brake defects or deficiencies on a commercial vehicle often indicated that other repairs were needed.

Additional Resources

For additional information on this technology, visit the American Association of State Highway and Transportation Officials' Technology Implementation Group Web site at www.aashtotig.org or the Federal Motor Carrier Safety Administration Web site at www.fmcsa.dot.gov.

For more information, contact:

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Benefits

Infrared brake screening technology:

- Detects commercial vehicles with defective brakes in real-time.
- Evaluates vehicles moving as fast as 64 kph (40 mph).
- Identifies problems accurately—69–76 percent of the wheels that the IRISystem identified as problematic were confirmed defective by the Level 1 inspection.